REMARKS/ARGUMENTS

Re-examination and favorable reconsideration in light of the above amendments and the following comments are respectfully requested.

Claims 34 - 52 are pending in the application. Currently, claims 34 - 47 stand rejected; and claims 48 - 52 stand withdrawn from consideration as being directed to a non-elected invention.

By the present amendment, claims 34 and 41 - 46 have been amended; and claims 48 - 52 have been cancelled without prejudice in view of the restriction requirement.

In the office action mailed October 29, 2009, claims 34 - 47 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite. By the present amendment, Applicant has made it clear that the gas is being injected only at a center of an area of the furnace chamber where the at least one workpiece is to be located. Clearly, this limitation does not mean that the gas is being injected into a center of the workpiece. During the cleaning step, there is no workpiece(s) in the furnace. Claim 34 clearly says that the at least one workpiece is placed into the furnace after the cleaning step. Nor does this limitation mean the center of the furnace chamber. The area being discussed is the area of the furnace chamber where the at least one workpiece is to be placed. This may be the center of the furnace chamber or it may be some other location in the furnace chamber. It depends on where the workpieces are being placed. In any event, the claim very clearly says that the gas is being injected into the center of an area of the furnace chamber where the at least one workpiece is to be located. It is submitted that the claim, when read in light of the specification, meets the requirements of 35 U.S.C. 112, second paragraph.

Independent claim 34, as amended herein, is directed to a method for heat treating at least one workpiece comprising the steps of: cleaning a furnace chamber to be used during said heat treating method; said cleaning step being performed without said at least one workpiece being present in said furnace chamber; said cleaning step comprising introducing a cleaning gas into the furnace chamber only at a center of an area where the at least one workpiece is to be located; said injecting step comprising injecting said gas at a partial pressure and a flow rate sufficient to create a pressure differential within said furnace chamber which carries contaminants away from said center of an area where the at least one workpiece is to be located and toward an exit of said furnace chamber; said cleaning step further comprising heating said furnace chamber at a temperature which is 200 to 300 degrees Fahrenheit above a temperature to be used in a subsequent diffusion heat treating step for at least 30 minutes; and after said cleaning step has been completed, placing said at least one workpiece within said cleaned chamber and diffusion heat treating said at least one workpiece in a gas atmosphere with said gas being introduced into the furnace chamber only at said center of an area in said furnace chamber where the at least one workpiece is to be located.

As discussed in prior responses, Applicants have found that significant improvements can be made in heat treating coated workpieces by first cleaning the chamber in which the workpieces are to be placed in a way which moves contaminants away from the area in which the workpieces are to be located. To this end, Applicants perform the cleaning process by injecting a gas into the furnace chamber *only* at a center of the area where the at least one workpiece is to be located. This is illustrated in Figure 1 of the instant application. The gas, which is

introduced solely at this location, is introduced at a partial pressure and a flow rate sufficient to create a pressure differential which carries contaminants away from said center and toward an exit of said furnace chamber. After cleaning has been completed, the at least one workpiece is placed in the cleaned chamber and subjected to a diffusion heat treatment where again the gas which is injected into the chamber is injected only at said center.

The improvements in the treated workpieces can be seen from Figures 2 to 4 in the application. Figure 2 illustrates a workpiece with an as deposited and diffused coating. Figure 3 illustrates a coating which has been formed using the method described herein and which was surface finished by shot peening. As can be seen from Figure 3, the coating is free of pores, voids, and other bad features. In fact, the coating is homogeneous and has very good ductility. Figure 4 illustrates a coating which was not formed using the clean furnace and heat diffusion treatment of the present invention. As can be seen from Figure 4, the coating has voids and fissures which makes it quite brittle.

In the October 29, 2009 office action, claims 34 - 47 were been rejected as being unpatentable over U.S. Patent No. 6,042,898 to Burns et al. alone and in view of JP 6219810 or JP 2003027209. It is believed that these references do not render the subject matter of claim 34 obvious. Burns et al. is directed to a method for applying improved durability thermal barrier coatings. During the processing of the coated article in Burns et al., undesired oxides and contaminants are removed from a bond coat with an ionized gas stream cleaning process, such as a reverse transfer arc process. See column 3, line 33 to column 4, line 23 of Burns et al. Clearly, Burns et al.

requires that the blade (2) to be cleaned be present in the vacuum chamber. This portion of Burns et al. is not describing the claimed technique for cleaning a furnace chamber prior to performing a diffusion heat treating step. Burns et al. is directed to cleaning a particular coating applied to an article. In other words, the article is already in the chamber during the cleaning operation. In contrast, Applicants are cleaning the chamber without any article or workpiece being present. This is now clearly spelled out in amended claim 34. Further, there is no disclosure in Burns et al. of injecting the gas used to remove the contaminants only at the center of the location where the workpieces are to be placed. Still further, there is no disclosure in Burns et al. of placing said at least one workpiece within said chamber after said cleaning step has been performed and diffusion heat treating said at least one workpiece in a gas atmosphere with said gas being injected only at said center of the area where the at least one workpiece is located.

The two Japanese patent documents do not cure these deficiencies in Burns et al. JP 62139810 relates to a method and apparatus for cleaning the interior of a tempering furnace. There is no disclosure of injecting a gas into the furnace only at the center of the location where workpieces are to be placed and there is no disclosure of injecting the gas at a partial pressure and a flow rate sufficient to create a pressure differential which carries contaminants away from said center and toward an exit of said furnace chamber. JP 2003027209 relates to a surface hardening treatment method for deep hole of parts in vacuum furnace. Here again, there is no disclosure of injecting a gas only at the center of the location where workpieces are to be placed and there is no disclosure of

injecting the gas at a partial pressure and a flow rate sufficient to create a pressure differential which carries contaminants away from said center and toward an exit of said furnace chamber.

Still further, neither Japanese reference discloses the step of after said cleaning step has been completed, placing said at least one workpiece within said cleaned chamber and diffusion heat treating said at least one workpiece in a gas atmosphere with said gas being injected only at said center.

For these reasons, the subject matter of amended claim 34 is not rendered obvious by the combination of references.

Claims 35 - 47 are allowable for the same reasons as their parent claims as well as on their own accord.

With regard to the Examiner's comments on page 6 of the office action, if the Examiner is not citing Burns for teaching the cleaning of the furnace before the heat treatment, then the cleaning portion of Burns is irrelevant. As for the diffusion heat treating step, there is no discussion at all in Burns where the gas is being injected. The claim is very specific that the gas during the diffusion injection step is to be introduced into the furnace chamber only at the center of an area in said furnace chamber where the at least one workpiece is to be located. Burns is silent on this point.

As for cleaning a contaminated furnace before heat treatment is contemplated, there is no question that this is known in the prior art. The first two paragraphs on page 4 of the specification discuss such prior art practices. What was not known in the prior art was how to clean the furnace chamber so that the problems such as an abundance of extensive open pockets, voids, fissures, cracks, or leaders can be avoided in the coating applied to the workpieces. This is the problem

which Applicants have solved and which solution is not taught by any of the cited and applied references.

With regard to the Examiner's argument in the second paragraph on page 6 of the action, the Examiner is correct that there can be many workpieces in a furnace chamber. However, what is missing from the Examiner's argument is any acknowledgement that the claim calls for introducing the gas into the furnace chamber only at the center of the area where these workpieces are located. The fact that the entire furnace chamber may be treated is irrelevant to the issue at hand - namely the method step which says specifically where the gas is to be introduced into the chamber. None of the references discuss this.

With regard to the Examiner's argument on page 6 of the action, the Examiner's contention that Applicants have not shown the criticality of the flow rate or the possession of an unexpected result is wrong. Applicants are surprised that the Examiner has not recognized the significant differences shown in the coatings of Figs. 3 and 4. Fig. 3 shows a coating which was formed using the method of the present invention. As can be seen from this figure, it is free of pores, voids, and other bad features. In comparison, the coating of Fig. 4, which was not formed using the heat diffusion treatment of the present invention is a poor quality coating which has voids and fissures which make it brittle. Applicants submit that there is nothing further required to show an unexpected result or the criticality of the claimed flow rate.

With regard to the Examiner's comments about it would have been obvious to one having ordinary skill in the art at the time the invention was made to manipulate the flow rate in order to remove contaminants, the Examiner forgets that it is not just

the flow rate which is needed to remove the contaminants. The key is the combination of the location where the gas is introduced into the flow chamber and the flow rate which is needed to remove the contaminants. None of the cited and applied references teach or suggest this combination of features. Just introducing a gas into the furnace chamber at any location with the claimed flow rate is not going to yield the result which is obtained by Applicants' method. Applicants are surprised that the Examiner does not recognize that Applicants are doing more than just discovering an optimum value.

For the foregoing reasons, the instant application is believed to be in condition for allowance. Such allowance is respectfully solicited.

Should the Examiner believe an additional amendment is needed to place the case in condition for allowance, he is hereby invited to contact Applicants' attorney at the telephone number listed below.

No fee is believed to be due as a result of this response. Should the Director determine that a fee is due, he is hereby authorized to charge said fee to Deposit Account No. 21-0279.

Respectfully submitted,

Steven M. Burns et al.

By/Barry L. Kelmachter #29999/
Barry L. Kelmachter
BACHMAN & LaPOINTE, P.C.
Reg. No. 29,999
Attorney for Applicants

Telephone: (203)777-6628 ext. 112
Telefax: (203)865-0297
Email: docket@bachlap.com

Date: January 29, 2010